

Claims

[c1] What is claimed is:

1. A switched capacitor circuit{500} comprising:
a capacitor;
a first switch element{504} for selectively coupling a first node{node A} to a second node{GND/VDD} according to a control signal{SW}, wherein the first node{node A} is coupled to the capacitor{502}; and
a charge circuit{506} coupled to the first node{node A} for coupling the first node{node A} to a third node{VDD/GND} and for controlling a voltage difference across the first switch element in the off-state to approach a predetermined charge voltage.

[c2] 2. The switched capacitor circuit of claim 1, wherein the charge circuit{506} selectively couples the first node{node A} to the third node{VDD/GND}[remark: key point of this claim: according to the control signal{SW}].

[c3] 3. The switched capacitor circuit of claim 2, wherein the charge circuit comprises{506}:
a diode{508} coupled between the first node and a fourth node; and
a third switch element{510} for selectively coupling the

fourth node to the third node{VDD/GND} according to the control signal{SW}.

- [c4] 4. The switched capacitor circuit of claim 3, wherein: the diode is formed by a transistor having the base and the collector, or the gate and the drain of the first transistor being shorted together.
- [c5] 5. The switched capacitor circuit of claim 3, wherein: the first switch{504} element is an n-type transistor; the third switch{510} element is a p-type transistor; the second node{ground} is ground; and the third node{VDD} is a constant supply voltage.
- [c6] 6. The switched capacitor circuit of claim 3, wherein: the first switch{504} element is a p-type transistor; the third switch{510} element is an n-type transistor; the second node{VDD} is a constant supply voltage; and the third node{GND} is ground.
- [c7] 7. A switched capacitor circuit comprising:
 - a positive side capacitor{902};
 - a negative side capacitor{904};
 - a first positive side switch element{906} for selectively coupling a first positive side node{node A} to a second node{GND/VDD} according to a control signal{SW}, wherein the first positive side node is coupled to the

positive side capacitor; a first negative side switch element{908} for selectively coupling a first negative side node{node B} to the second node{GND/VDD} according to the control signal{SW}, wherein the first negative side node{node B} is coupled to the negative side capacitor{902}; and a charge circuit{912} coupled to the first positive side node{node A} and the first negative side node for coupling the first positive side node and the first negative side node to a third node{VDD/GND} and for controlling a first voltage difference across the first positive side switch element in the off-state and a second voltage difference across the first negative side switch element in the off-state to approach a predetermined charge voltage.

- [c8] 8. The switched capacitor circuit of claim 7, wherein the charge circuit selectively couples the first positive side node and the first negative side node to the third node according to the control signal.
- [c9] 9. The switched capacitor circuit of claim 8, wherein the charge circuit comprises:
 - a positive side diode{916} coupled between the first positive side node{node A} and a fourth node;
 - a negative side diode{918} coupled between the first negative side node{node B} and a fourth node; and

a third switch element{914} for selectively coupling the fourth node to the third node{VDD/GND} according to the control signal{SW}.

- [c10] 10. The switched capacitor circuit of claim 9, wherein:
the positive side diode is formed by a first transistor having the base and the collector, or the gate and the drain of the first transistor being shorted together; and the negative side diode is formed by a second transistor having the base and the collector, or the gate and the drain of the second transistor being shorted together.
- [c11] 11. The switched capacitor circuit of claim 9, wherein:
the first positive side switch element is an n-type transistor;
the first negative side switch element is an n-type transistor;
the third switch element is a p-type transistor;
the second node{ground} is ground; and
the third node{VDD} is a constant supply voltage.
- [c12] 12. The switched capacitor circuit of claim 9, wherein:
the first positive side switch element is a p-type transistor;
the first negative switch element is a p-type transistor;
the third switch element is an n-type transistor;
the second node{VDD} is a constant supply voltage; and

the third node{ground} is ground.

- [c13] 13. The switched capacitor circuit of claim 7, further comprising a center switch element{910} for selectively coupling the first positive side node{node A} to the first negative side node{node B} according to the control signal.
- [c14] 14. A method for controlling a switched capacitor circuit, the method comprising the following steps: providing a capacitor and a first switch element; disconnecting a first node from a second node according to a control signal utilizing the first switch element, wherein the first node is coupled to the capacitor; and coupling the first node to a third node for controlling a voltage difference across the first switch element in the off-state to approach a predetermined charge voltage.
- [c15] 15. The method of claim 14, further comprising selectively coupling the first node to the third node according to the control signal.
- [c16] 16. The method of claim 15, wherein selectively coupling the first node to the third node according to the control signal comprises: providing a diode coupled between the first node and a fourth node; and

providing a third switch element for selectively coupling the fourth node to the third node according to the control signal.

- [c17] 17. The method of claim 16, wherein:
the diode is formed by a transistor having the base and the collector, or the gate and the drain of the first transistor being shorted together.
- [c18] 18. The method of claim 16, wherein:
the first switch{504} element is an n-type transistor;
the third switch{510} element is a p-type transistor;
the second node{ground} is ground; and
the third node{VDD} is a constant supply voltage.
- [c19] 19. The method of claim 16, wherein:
the first switch{504} element is a p-type transistor;
the third switch{510} element is an n-type transistor;
the second node{VDD} is a constant supply voltage; and
the third node{GND} is ground.
- [c20] 20. A method for controlling a switched capacitor circuit, the method comprising the following steps:
providing a positive side capacitor and a first positive side switch element;
providing a negative side capacitor and a first negative side switch element;

disconnecting a first positive side node and a first negative side node from the second node according to the control signal respectively utilizing the first positive side switch element and the first negative side switch element, wherein the first positive side node is coupled to the positive side capacitor and the first negative side node is coupled to the negative side capacitor; and coupling the first positive side node and the first negative side node to the third node such that a first voltage difference across the first positive side switch element in the off-state and a second voltage difference across the first negative side switch element in the off-state both approach to a predetermined charge voltage.

- [c21] 21. The method of claim 20, further comprising selectively coupling the first positive side node and the first negative side node to the third node according to the control signal.
- [c22] 22. The method of claim 21, wherein selectively coupling the first positive side node and the first negative side node to the third node according to the control signal comprises:
 - providing a positive side diode coupled between the first positive side node and a fourth node; and
 - providing a negative side diode coupled between the first negative side node and a fourth node; and

providing a third switch element for selectively coupling the fourth node to the third node according to the control signal.

- [c23] 23. The method of claim 22, wherein:
 - the positive side diode is formed by a first transistor having the base and the collector, or the gate and the drain of the first transistor being shorted together; and
 - the negative side diode is formed by a second transistor having the base and the collector, or the gate and the drain of the second transistor being shorted together.
- [c24] 24. The method of claim 23, wherein:
 - the first positive side switch element is an n-type transistor;
 - the first negative side switch element is an n-type transistor;
 - the third switch element is a p-type transistor;
 - the second node is ground; and
 - the third node is a constant supply voltage.
- [c25] 25. The method of claim 23, wherein:
 - the first positive side switch element is a p-type transistor;
 - the first negative switch element is a p-type transistor;
 - the third switch element is an n-type transistor;
 - the second node is a constant supply voltage; and

the third node is ground.

- [c26] 26. The method of claim 20, further comprising selectively coupling the first positive side node to the first negative side node according to the control signal utilizing a center switch element.